

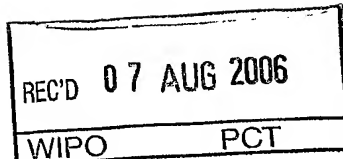
# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference R608-PCT	<b>FOR FURTHER ACTION</b>		See Form PCT/IPEA/416
International application No. PCT/JP2005/008464	International filing date (day/month/year) 27.04.2005	Priority date (day/month/year) 27.04.2004	
International Patent Classification (IPC) or national classification and IPC INV. C01G25/00 C01G1/02 B01D53/86 B01D53/94 B01J23/10 B01J35/10			
Applicant TOYOTA JIDOSHA KABUSHIKI KAISHA			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 2 sheets, as follows:</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input checked="" type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  27.02.2006		Date of completion of this report  03.08.2006	
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized officer  Siebel, E  Telephone No. +31 70 340-1016  	

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/JP2005/008464

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of:
  - ☐ international search (under Rules 12.3(a) and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4(a))
  - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements**\* of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

**Description, Pages**

1-20 as originally filed

**Claims, Numbers**

1-7 received on 27.02.2006 with letter of 24.02.2006

**Drawings, Sheets**

1 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
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**Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

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1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application,
- ☐ claims Nos.

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed (*specify*).
- ☐ no international search report has been established for the said claims Nos.
- ☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:
  - ☐ furnish a sequence listing on paper complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Preliminary Examining Authority in a form and manner acceptable to it.
  - ☐ furnish a sequence listing in electronic form complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Preliminary Examining Authority in a form and manner acceptable to it.
  - ☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rules 13~~ter~~.1(a) or (b) and 13~~ter~~.2.
- ☐ a meaningful opinion could not be formed without the tables related to the sequence listings; the applicant did not, within the prescribed time limit, furnish such tables in electronic form complying with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions, and such tables were not available to the International Preliminary Examining Authority in a form and manner acceptable to it.
- ☐ the tables related to the nucleotide and/or amino acid sequence listing, if in electronic form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.
- ☒ See separate sheet for further details

**INTERNATIONAL PRELIMINARY REPORT  
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International application No.  
PCT/JP2005/008464

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-7
	No: Claims	
Inventive step (IS)	Yes: Claims	1-7
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-7
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

Reference is made to the following documents:

D1: JP2004074138 A

D2: JP2003277060 A & computer translation

D3: A.F. Hollemann, E. Wiberg, Lehrbuch der Anorganischen Chemie, 101. Auflage, Walter de Gruyter 1995, page 929, § "Hydrophobe Kolloide"

1. The amendments filed with the letter dated 24.02.2006 do not introduce subject-matter which extends beyond the content of the application as filed, according to Article 34(2)(b) PCT.
  - 1.1. The present claim 1 relates to an extremely large number of possible compounds. Support and disclosure in the sense of Article 6 and 5 PCT is to be found however for only a very small proportion of the compounds claimed, see [description page 4, line 29 to page 5, line 18; page 13, line 22 to page 20, line 34]. Support and disclosure can only be found for a catalyst support particle comprising zirconia, ceria, alumina and/or titania particles.

The lack of clarity notwithstanding :

2. The document D1 discloses a zirconia( $\text{ZrO}_2$ ) core particle coated with ceria ( $\text{CeO}_2$ ) particles. In a first step zirconium nitrate is hydrolysed to obtain zirconium hydroxide at 80°C with ammonia. In a second step, ceria is precipitated on the zirconium hydroxide, the obtained precipitate is filtered, dried and calcined at 600°C (see example 1 and fig.1).
  - 2.1. The subject-matter of claim 1 differs in that the zirconia core comprises a plurality of zirconia primary particles.
  - 2.2. The subject-matter of claim 1 is new in the sense of article 33(2) PCT.
  - 2.3. The problem to be solved in view of the distinguishing feature may therefore be

regarded as is to provide an exhaust catalyst having a high activity even at low temperature.

- 2.4. Document D2 discloses an exhaust catalyst prepared by mixing a sol of ceria with a sol of zirconia and optionally another metal precursor, drying and calcining the obtained mixture (see D2, [0008], [0013] - [0019]). However, as it can be seen from figure 1 (of D2), it appears that the core does not consist of a multitude of primary particles and the surface appears to homogeneously coated.
- 2.5. Therefore, the solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT), as the prior art does not suggest or does not give a hint, a skilled person could not solve the problem without an inventive skill.
3. Claims 2-5 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to inventive step.
- 4.1. Claim 6 refers to an exhaust gas purifying catalyst comprising the catalyst support particles of claim 1 and therefore claim 6 is also considered novel and inventive in the sense of Article 33(2) PCT and Article 33(3) PCT respectively.
- 4.2. Claim 7 refers to the process of producing the catalyst support particles of claim 1 and therefore claim 6 is also considered novel and inventive in the sense of Article 33(2) PCT and Article 33(3) PCT respectively.

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CLAIMS

1. A catalyst support particle comprising a core part and a surface layer,  
wherein the molar fraction of the metal constituting  
5 the first metal oxide in the core part is higher than the molar fraction of the metal constituting the first metal oxide in the surface layer;  
wherein the molar fraction of the metal constituting  
the second metal oxide in the surface layer is higher  
10 than the molar fraction of the metal constituting the second metal oxide in the core part;  
wherein said core part and said surface layer each comprises a plurality of primary particles; and  
wherein the primary particle diameter of said second  
15 metal oxide is smaller than the primary particle diameter of said first metal oxide.
2. The catalyst support particle according to claim 1, wherein the first and second metal oxides are independently selected from the group consisting of  
20 alumina, zirconia, titania and ceria.
3. The catalyst support particle according to claim 2, wherein said first metal oxide is zirconia and said second metal oxide is ceria.
4. The catalyst support particle according to  
25 claim 3, wherein the catalyst support particle has a particle diameter of 2.3 to 8.1  $\mu\text{m}$ .
5. The catalyst support particle according to claim 3 or 4, wherein the primary particle diameter of zirconia constituting said core part is 100 nm or less.
- 30 6. An exhaust gas purifying catalyst comprising a noble metal supported on the catalyst support particle according to any one of claims 1 to 5.
7. A process for producing the catalyst support particle according to claim 1, comprising:  
35 providing a sol containing at least a population of first metal oxide colloid particles and a population of second metal oxide colloid particles

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- differing in the isoelectric point with each other, the particle diameter of said population of second metal oxide colloid particles being smaller than the particle diameter of said population of first metal oxide colloid particles,
- 5                    adjusting the pH of said sol to be closer to the isoelectric point of said population of first metal oxide colloid particles than to the isoelectric point of said population of second metal oxide colloid particles, thereby aggregating said population of first
- 10                   metal oxide colloid particles,
- adjusting the pH of said sol to be closer to the isoelectric point of said population of second metal oxide colloid particles than to the isoelectric point of said population of first metal oxide colloid
- 15                   particles, thereby aggregating said population of second metal oxide colloid particles onto said population of first metal oxide colloid particles aggregated, and
- drying and firing the obtained aggregate.